

# Extruded Clay-Based Regoliths for Construction on Mars, Phobos and NEAs, Phase I

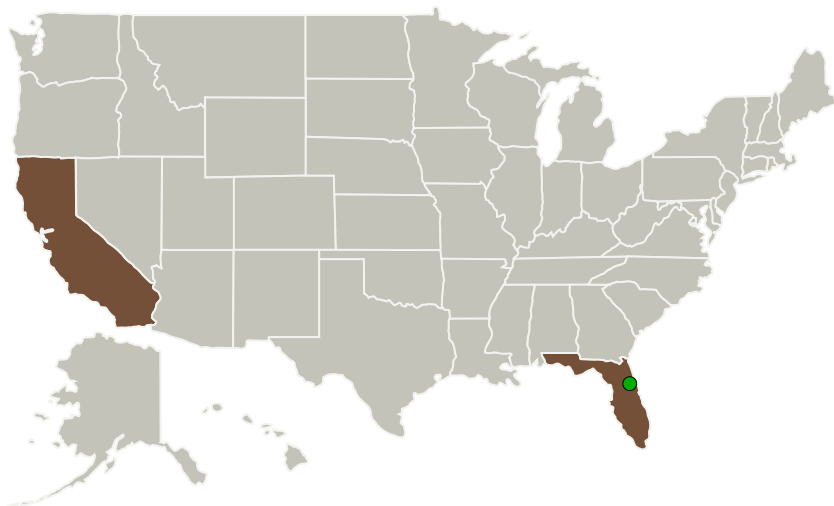
Completed Technology Project (2016 - 2016)



## Project Introduction

Research by Deep Space Industries and the University of Central Florida last year discovered an intriguing property of the carbonaceous asteroid simulants being developed. We noticed that simply wetting the material, mixing it thoroughly, and drying it (in vacuum or air) at ambient temperature causes it to bond into solid, very hard rock, and we could control the hardness by the amount of water mixed into it before drying. On Earth when making bricks from clay we need to fire them in a kiln at temperatures as high as 1300°C to make them hard. Apparently simple air or vacuum drying of these minerals can substitute for the kiln effectively, making it easily hard enough for construction in the space environment. Carbonaceous asteroids are not the only place in space where clayey regolith can be used for construction. Recently, scientists have shown that Mars has abundant clay deposits all over the globe. The minerals on Phobos appear similar to those in a certain type of carbonaceous asteroid including phyllosilicates (the type of minerals that include clays), so apparently Phobos may have abundant clay minerals, too. This suggests construction by low-temperature vacuum drying is possible on those bodies. It is not possible on the Moon, however, as there are no phyllosilicates on the Moon.

## Primary U.S. Work Locations and Key Partners



Extruded Clay-Based Regoliths for Construction on Mars, Phobos and NEAs, Phase I

## Table of Contents

Project Introduction	1
Primary U.S. Work Locations and Key Partners	1
Project Transitions	2
Images	2
Organizational Responsibility	2
Project Management	2
Technology Maturity (TRL)	2
Technology Areas	3
Target Destinations	3

## Extruded Clay-Based Regoliths for Construction on Mars, Phobos and NEAs, Phase I

Completed Technology Project (2016 - 2016)



Organizations Performing Work	Role	Type	Location
Deep Space Industries, Inc.	Lead Organization	Industry	San Jose, California
● Kennedy Space Center(KSC)	Supporting Organization	NASA Center	Kennedy Space Center, Florida

Primary U.S. Work Locations	
California	Florida

## Project Transitions

**June 2016:** Project Start**December 2016:** Closed out

**Closeout Summary:** Extruded Clay-Based Regoliths for Construction on Mars, Phobos and NEAs, Phase I Project Image

**Closeout Documentation:**

- Final Summary Chart Image(<https://techport.nasa.gov/file/139716>)

## Images

**Briefing Chart Image**

Extruded Clay-Based Regoliths for Construction on Mars, Phobos and NEAs, Phase I  
(<https://techport.nasa.gov/image/132903>)

**Final Summary Chart Image**

Extruded Clay-Based Regoliths for Construction on Mars, Phobos and NEAs, Phase I Project Image  
(<https://techport.nasa.gov/image/127990>)

## Organizational Responsibility

**Responsible Mission Directorate:**

Space Technology Mission Directorate (STMD)

**Lead Organization:**

Deep Space Industries, Inc.

**Responsible Program:**

Small Business Innovation Research/Small Business Tech Transfer

## Project Management

**Program Director:**

Jason L Kessler

**Program Manager:**

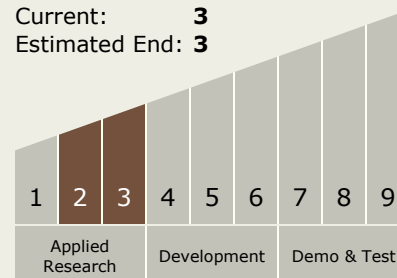
Carlos Torrez

**Principal Investigator:**

John S Lewis

## Technology Maturity (TRL)

Start: 2  
Current: 3  
Estimated End: 3



# Extruded Clay-Based Regoliths for Construction on Mars, Phobos and NEAs, Phase I

Completed Technology Project (2016 - 2016)



## Technology Areas

### Primary:

- TX07 Exploration Destination Systems
  - └ TX07.1 In-Situ Resource Utilization
    - └ TX07.1.4 Resource Processing for Production of Manufacturing, Construction, and Energy Storage Feedstock Materials

## Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System